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Report of the technical assessment of the proposed forest reference level of Cambodia submitted in 2017

Summary

This report covers the technical assessment of the submission of Cambodia, on a voluntary basis, on its proposed forest reference level (FRL), in accordance with decision 13/CP.19 and in the context of results-based payments. The FRL proposed by Cambodia covers the activities "reducing emissions from deforestation", "reducing emissions from forest degradation" and "enhancement of forest carbon stocks", which are among the activities included in decision 1/CP.16, paragraph 70. In its submission, Cambodia has developed a national FRL. The FRL presented in the submission, for the reference period 2006–2014, corresponds to 79,245,653 tonnes of carbon dioxide equivalent per year (t CO_2 eq/year). As a result of the facilitative process during the technical assessment, the FRL was modified to 78,953,951 t CO_2 eq/year. The assessment team notes that the data and information used by Cambodia in constructing its FRL are transparent, complete and in overall accordance with the guidelines contained in the annex to decision 12/CP.17. This report contains the assessed FRL and a few areas identified by the assessment team for further technical improvement, according to the scope of the technical assessment in the annex to decision 13/CP.19.

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I. Introduction and summary

A. Overview

1. This report covers the technical assessment (TA) of the submission of Cambodia on its proposed forest reference level (FRL),[1] submitted on 18 November 2016 in accordance with decisions 12/CP.17 and 13/CP.19. The TA took place (as a centralized activity) from 13 to 17 March 2017 in Bonn, Germany, and was coordinated by the UNFCCC secretariat.[2] The TA was conducted by two land use, land-use change and forestry experts from the UNFCCC roster of experts[3] (hereinafter referred to as the assessment team (AT)): Mr. Jason Funk (United States of America) and Ms. Diana Marcela Vargas (Colombia). In addition, Mr. Brian Mantlana, an expert from the Consultative Group of Experts on National Communications from Parties not included in Annex I to the Convention, participated as an observer[4] during the centralized activity in Bonn. The TA was coordinated by Mr. Dirk Nemitz (UNFCCC secretariat).

2. In response to the invitation by the Conference of the Parties (COP) and in accordance with the provisions of decision 12/CP.17, paragraphs 7–15, and its annex, Cambodia submitted its proposed FRL on a voluntary basis. The proposed FRL is one of the elements[5] to be developed in the implementation of the activities referred to in decision 1/CP.16, paragraph 70. The COP decided that each submission of a proposed FRL or forest reference emission level (FREL), as referred to in decision 12/CP.17, paragraph 13, shall be subject to a TA in the context of results-based payments, pursuant to decision 13/CP.19, paragraphs 1 and 2, and decision 14/CP.19, paragraphs 7 and 8.

3. Cambodia provided its submission in English. The submission is supported by four annexes: emission/removal calculation tables (annex 1); description of land-use/cover types (annex 2); detailed methodology for acquiring activity data (annex 3); and detailed methodology for acquiring above-ground biomass values for emission factors (annex 4). The annexes were considered by the AT as part of the FRL submission.

4. The objective of the TA was to assess the degree to which the information provided by Cambodia was in accordance with the guidelines for submissions of information on FRELs/FRLs[6] and to offer a facilitative, non-intrusive, technical exchange of information on the construction of the FRL with a view to supporting the capacity of Cambodia for the construction and further improvement of its FRELs/FRLs, as appropriate.[7]

5. The TA of the FRL submitted by Cambodia was undertaken in accordance with the guidelines and procedures for the TA of submissions from Parties on proposed FRELs and/or FRLs as contained in the annex to decision 13/CP.19. This report on the TA was prepared by the AT following the guidelines and procedures contained in the same decision.

6. Following the process contained in those guidelines and procedures, a draft version of this report was communicated to Cambodia. The facilitative exchange during the TA allowed Cambodia to provide clarifications and information that were considered by the AT in the preparation of this report.[8] As a result of the facilitative interactions with the AT during the TA, Cambodia submitted a modified version of its FRL on 22 May 2017, which took into consideration the technical inputs provided by the AT. The modifications improved the clarity and transparency of the submitted FRL. This TA report was prepared

[1] The submission of Cambodia is available at http://redd.unfccc.int/submissions.html?country=khm.
[2] Decision 13/CP.19, annex, paragraph 7.
[3] Decision 13/CP.19, annex, paragraphs 7 and 9.
[4] Decision 13/CP.19, annex, paragraph 9.
[5] Decision 1/CP.16, paragraph 71(b).
[6] Decision 12/CP.17, annex.
[7] Decision 13/CP.19, annex, paragraph 1(a) and (b).
[8] Decision 13/CP.19, annex, paragraphs 1(b), 13 and 14.

in the context of the modified FRL submission. The modified submission, containing the assessed FRL, and the original submission are available on the UNFCCC website.[9]

B. Proposed forest reference level

7. The national FRL proposed by Cambodia for the historical reference period 2006–2014 is the annual average of the net carbon dioxide (CO_2) emissions associated with deforestation, which in this context includes degradation and the enhancement of carbon stocks in forest land remaining forest land (with changes only in forest subcategories), and the removals of CO_2 from the atmosphere through afforestation when other land uses are converted to forest land. The forest definition adopted by Cambodia for REDD-plus[10] explicitly excludes rubber plantations, oil palm plantations and perennial crops; therefore, the proposed FRL includes emissions from the conversion of forests to those land-use categories and the conversion of forests to other non-forest land-use categories. The information on activity data used in constructing the FRL was extracted from a historical time series of land-use maps for 2006, 2010 and 2014. Land-use maps for earlier historical time series (before 2006) were found to have inconsistencies in the definition of forest and the forest classification used before 2006; therefore, Cambodia only used information from the maps for 2006, 2010 and 2014. Cambodia has not yet conducted a national forest inventory, so the information on emission factors was developed from a literature survey and data from various forest inventory surveys implemented in Cambodia and analysed for values of biomass density, as compiled by the United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (UN-REDD Programme).[11] The FRL presented in the modified submission with the aim of accessing results-based payments for REDD-plus activities from 2015 to 2020 corresponds to 78,953,951 t CO_2 eq/year.

8. In decision 1/CP.16, paragraph 70, the COP encourages developing country Parties to contribute to mitigation actions in the forest sector by undertaking a number of activities, as deemed appropriate by each Party and in accordance with their respective capabilities and national circumstances, in the context of the provision of adequate and predictable support. The FRL proposed by Cambodia, on a voluntary basis, for a TA in the context of results-based payments, covers the activities "reducing emissions from deforestation", "reducing emissions from forest degradation" and "enhancement of forest carbon stocks", which are three of the five activities included in decision 1/CP.16, paragraph 70. Pursuant to paragraph 71(b) of the same decision, Cambodia has developed a national FRL for its entire national territory. In its submission, Cambodia notes its intention to apply a stepwise approach to the development of its FRL, in accordance with decision 12/CP.17, paragraph 10. The stepwise approach enables Parties to improve their FREL/FRL over time by incorporating better data, improved methodologies and, where appropriate, additional pools.

9. The proposed FRL includes the above-ground and below-ground biomass pools and excludes the litter, deadwood and soil organic matter pools. Regarding greenhouse gases (GHGs), the submission includes CO_2.

10. In terms of clarification and transparency, the information provided by Cambodia in the four annexes to the FRL submission was essential for understanding the FRL. That information was considered by the AT as part of the TA.

[9] http://redd.unfccc.int/submissions.html?country=khm.

[10] In decision 1/CP.16, paragraph 70, the COP encourages developing country Parties to contribute to mitigation actions in the forest sector by undertaking the following activities: reducing emissions from deforestation; reducing emissions from forest degradation; conservation of forest carbon stocks; sustainable management of forests; and enhancement of forest carbon stocks.

[11] The information is compiled in the following document: Sola G, Vanna S, Vesa L, et al. 2014. *Forest Biomass in Cambodia: from Field Plot to National Estimates*. Phnom Penh, Cambodia: UN-REDD Programme. Available at www.cambodia-redd.org/wp-content/uploads/2016/01/Forest-biomass-in-Cambodia-from-field-plots-to-national-estimates.pdf.

II. Data, methodologies and procedures used in the construction of the proposed forest reference level

How each element in the annex to decision 12/CP.17 was taken into account in the construction of the forest reference level

1. Information that was used by the Party in the construction of the forest reference level

11. For the construction of its FRL, Cambodia used the methodologies provided by the Intergovernmental Panel on Climate Change (IPCC) in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines) and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF). Cambodia's approach is based on the historical average of emissions and removals from land-cover change over eight years, from 2006 to 2014. The activity data are forest cover and land-use change areas derived from 2006, 2010 and 2014 historical forest cover maps, resulting in a land-use change matrix, which is then multiplied by the difference between the emission factors for these two land-use categories. Cambodia considered changes from forest land to non-forest land, such as paddy fields and perennial crops, as deforestation, and changes from non-forest land to forest land as afforestation. Cambodia also used this approach to quantify net emissions from forest degradation and enhancement of forest carbon stocks within forest land remaining forest land (with a change only in the forest subcategory).

12. Activity data were generated by estimating areas of change from land-use classes and subclasses from one land-cover map to the next. Land-cover maps were developed from Landsat images by generating polygons via automatic segmentation and assigning the class of each segment by visual interpretation according to a forest and non-forest substratification. The minimum mapping unit of the land-use/cover classes was 5 ha for 2014 and 25 ha for 2006 and 2010. To avoid potential misclassification due to changes in the minimum mapping unit in 2006, 2010 and 2014, Cambodia checked and made corrections using higher-resolution satellite imagery (NDVI time-series data, ALOS AVNIR-2 for 2010, and RapidEye and Google Earth high-resolution images for 2014) supplemented by ground-truth surveys.

13. Emission factors were estimated by calculating the carbon stock per unit area before and after land-cover changes. Post-deforestation carbon stock was assumed to be zero. For above-ground biomass in three types of forest (evergreen, semi-evergreen and deciduous), Cambodia selected the average of the estimated above-ground biomass for three different plot types: community forests, REDD-plus related projects, and permanent sample plots, which together make up 90.54 per cent of the forest cover in Cambodia. IPCC default values for above-ground biomass for four forest types (pine forest, flooded forest, pine plantation and tree plantation) were drawn from the IPCC good practice guidance for LULUCF or the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, consistent with Cambodia's second national communication. Data for above-ground biomass for mangrove, rear mangrove and forest regrowth were drawn from regionally specific literature sources. Data for below-ground biomass were estimated applying a ratio recommended for tropical forests from the IPCC good practice guidance for LULUCF. The bamboo land-cover type was assigned a value of zero carbon stock in biomass, effectively treating it as non-forest for the purpose of calcul[illegible]g the FRL.

2. Transparency, completeness, consistency and accuracy of the information used in the construction of the forest reference level

Methodological information, including description of data sets, approaches and methods

14. The AT noted that much of the information necessary to assess the transparency, accuracy and completeness of the FRL was contained in the annexes to the submission. The AT considered the information and was able to reproduce the calculation of the FRL accurately when using both the information contained in the main text and that in the annexes.

15. The AT noted that Cambodia has updated the information used to calculate its FRL since it submitted its most recent GHG inventory (for 2000). Cambodia clarified during the TA that data and information in future GHG inventories will be consistent with the FRL. The AT considers this to be a step towards improving transparency and accuracy, and commends Cambodia for making improvements, even if this leads to a temporary inconsistency with the GHG inventories that have already been submitted.

16. The AT commends Cambodia for utilizing the best available historical data from three different years: 2006, 2010 and 2014. The AT noted the efforts made by Cambodia to maintain internal consistency in the calculation of the FRL, including by using data sources with a consistent definition of forest and by undertaking a robust quality assurance/quality control process to minimize misclassifications of activity data.

17. The AT commends Cambodia for its efforts to develop its FRL, noting that the FRL is national in scope and addresses the most significant activities affecting forest carbon stocks. The AT noted the effort made by Cambodia to include emissions from forest degradation and to exclude rubber plantations, oil palm plantations and perennial crops from the definition of forest. The AT also noted that, in the modified submission, Cambodia excluded emissions and removals from natural forest converted to forest plantations.

18. The AT noted that the information used to develop the emission factors for the evergreen, semi-evergreen and deciduous forest types was overall complete and transparent. After Cambodia provided additional information and the modified submission, the AT was able to assess the accuracy of the emission factors used for the FRL. The above-mentioned forest types collectively comprise more than 90 per cent of Cambodia's forests (35 per cent evergreen, 13 per cent semi-evergreen and 41 per cent deciduous forest), so the emission factors have a significant impact on the overall scale of the FRL. The values for evergreen and deciduous forest are within the range of emission factors for other forests in eastern Asia (between 25 and 205 t above-ground biomass/ha) provided in the IPCC good practice guidance for LULUCF (p.3.160, table 3A.1.4). The value for semi-evergreen forest (13 per cent of forest land) used by Cambodia is slightly outside of that range (243 t above-ground biomass/ha). During the facilitative exchange, Cambodia noted this as an area for further technical improvement, which will be addressed through the implementation of the national forest inventory.

19. The AT noted the inclusion of additional data used to estimate emission factors in the modified submission, which clarified that the emission factors for the three key forest classes (evergreen, semi-evergreen and deciduous) were calculated by averaging the data for each forest type across all regions and management systems in Cambodia. Such an approach will have an impact on the accuracy of the estimates, and the AT notes introducing additional levels of stratification that consider more homogeneous carbon stocks, considering high variability due to regional differences and different activities in forest management, as an area for further technical improvement.

20. The AT commends Cambodia for continuing to work on updating and improving the sources of data, noting Cambodia's plan to implement its recently designed national forest inventory, which is expected to improve the national emission factors. The AT considers the availability of such information as an area for further technical improvement, which would significantly improve the transparency and reproducibility of future FRL submissions.

21. The AT commends Cambodia for providing clarifications and additional information during the facilitative exchange, the most important of which were:

(a) Providing key references and data related to estimates of emission factors;

(b) Clarifying the process for generating activity data;

(c) Explaining the quality assurance/quality control applied to the activity data;

(d) Providing additional information relevant to the calculation of transitions of land cover from one forest type to another, which was necessary to estimate emissions and removals from forest degradation and the enhancement of forest carbon stocks.

Description of relevant policies and plans, as appropriate

22. Information about past, current and future domestic policies and plans was included as part of the description of Cambodia's forest sector (section 1.2) and national circumstances during the historical period covered by the FRL (section 4.5). The information provided a qualitative analysis of the drivers of deforestation and forest degradation as an overview of the expected implications of Cambodia's future emissions.

3. Pools, gases and activities included in the construction of the forest reference level

23. According to decision 12/CP.17, annex, subparagraph (c), reasons for omitting a pool and/or activity from the construction of the FRL should be provided, noting that significant pools and/or activities should not be excluded.

24. The AT commends Cambodia for including two carbon pools, above-ground biomass and below-ground biomass, in the FRL, noting that country-specific data were not available for the litter, deadwood and soil carbon pools. The AT notes Cambodia's intention to include all five carbon pools in its future FRL submissions as part of the stepwise approach.

25. The AT considers that the omission of pools could result in the underestimation of historical emissions, thereby reducing the risk of overestimating future emission reductions. Future improvements aimed at including additional pools should include steps to ensure consistency in the methodological approach. However, the AT considers that the exclusion of soil organic carbon, for which default values exist in the 2006 IPCC Guidelines, is adequately justified by Cambodia because of the lack of spatial data on the extent of organic soils. The AT commends Cambodia for its intention to obtain better information on this pool in the future with the aim of including it as part of the stepwise approach, and notes this as an area for further technical improvement.

26. The AT noted that Cambodia's FRL only included CO_2; it did not include information on other non-CO_2 GHGs, such as methane and nitrous oxide, owing to the lack of available data for those gases. The AT considers the treatment of non-CO_2 gases to be an area for further technical improvement.

27. The AT commends Cambodia for its efforts to include in its FRL all significant activities ("reducing emissions from deforestation", "reducing emissions from forest degradation" and "enhancement of forest carbon stocks") of the five activities identified in decision 1/CP.16, paragraph 70, in accordance with its national capabilities and circumstances. The AT notes that the other two activities, namely "conservation of forest carbon stocks" and "sustainable management of forests", could be significant in a future FRL. The AT also notes that the current exclusion of those activities from the FRL appears to be conservative. The AT further notes this as an area for technical improvement in future submissions and welcomes Cambodia's intention to include further information about these activities as part of the stepwise approach.

28. Overall, the AT commends Cambodia for the information provided in the FRL submission and its annexes. The AT acknowledges the intention expressed by Cambodia to implement its national forest inventory plan, streamline REDD-plus in the government policy and gather additional information about these areas, as future technical improvements.

4. Definition of forest

29. Cambodia provided in its submission the definition of forest used in the construction of the FRL (minimum area of 0.5 ha, height of 5 m or more and at least 10 per cent canopy cover). The definition is the same as the one that the Party uses in its forest resources assessment for reporting to the Food and Agriculture Organization of the United Nations, except that rubber plantations, oil palm plantations and perennial crops are not reported as forests.

III. Conclusions

30. The information used by Cambodia in constructing its FRL for deforestation, forest degradation and enhancement of forest carbon stocks is in overall accordance with the guidelines for submissions of information on FRELs/FRLs (as contained in the annex to decision 12/CP.17). The AT noted that the FRL was consistently estimated with the information and descriptions provided by the Party. The AT was able to independently reproduce the FRL estimation using the information and descriptions provided, noting that the emission factor for semi-evergreen forest was slightly out of the expected range for the region (see para. 18 above).

31. The AT acknowledges that Cambodia included in its FRL the most significant activities covering the entire national territory and the most significant pools in terms of emissions from forests. In doing so, the AT considers that Cambodia followed decision 1/CP.16, paragraph 70, on activities undertaken, paragraph 71(b), on elaboration of a national FRL, and decision 12/CP.17, paragraph 10, on implementing a stepwise approach. The AT commends Cambodia for the information provided on the ongoing work on developing FRLs for other activities.

32. As a result of the facilitative interactions with the AT during the TA, Cambodia submitted a modified FRL that took into consideration the technical inputs of the AT. The AT noted that the transparency and completeness of information was improved significantly in the modified FRL submission; while the value of the FRL was also slightly modified, without the need to alter the approach or values used to construct the FRL, and the AT commends Cambodia for the efforts made. The new information provided in the modified submission and the examples of how CO_2 emissions from deforestation were estimated increased the reproducibility of the FRL calculations.

33. The AT noted that, overall, the FRL submission provides sufficient information to establish the degree of consistency, in terms of sources of activity data and emission factors, with the GHG inventory included in Cambodia's national communication, while utilizing updated and improved sources of information.[12]

34. Pursuant to decision 13/CP.19, annex, paragraph 3, the AT identified the following areas for further technical improvement:

(a) Improve the accuracy of estimating emission factors by using more levels/criteria in the stratification (see paras. 18 and 19 above);

(b) Implement the recently designed national forest inventory and use the resulting improved national emission factors for future FRL submissions (see para. 20 above);

(c) Obtain better information on the litter, deadwood and soil organic carbon pools with the aim of including the information in the FRL as part of the stepwise approach (see paras. 24 and 25 above);

(d) Consider the inclusion of non-CO_2 gases in the FRL (see para. 26 above).

35. The AT acknowledges and welcomes the intention expressed by Cambodia to include further information about other REDD-plus activities in future FRL submissions as part of the stepwise approach.

36. In conclusion, the AT commends Cambodia for showing a strong commitment to the continuous improvement of its FRL estimates in line with the stepwise approach. Areas for further technical improvement of Cambodia's FRL have been identified in this report. The AT acknowledges that such improvements are subject to national capabilities and policies, and notes the importance of adequate and predictable support.[13] The AT also acknowledges that the assessment process was an opportunity for a rich, open, facilitative and constructive technical exchange of information with Cambodia.

[12] In reference to the scope of the TA, decision 13/CP.19, annex, paragraph 2(a).

[13] Decision 13/CP.19, annex, paragraph 1(b), and decision 12/CP.17, paragraph 10.

37. The table contained in the annex summarizes the main characteristics of Cambodia's proposed FRL.

Annex

Summary of main features of the proposed forest reference level based on information provided by the Party

Main features of the FRL		*Remarks*
Proposed FRL (in t CO_2 eq/year)	78 953 951	See paragraph 7 of this document
Type and duration of FRL	FRL based on historical average net emissions from deforestation from 2006 to 2014	See paragraph 7 of this document
Adjustment for national circumstances	No	
National/subnational[a]	National	Cambodia has developed a national FRL for the entire national territory (see para. 8 of this document)
Activities included[b]	Deforestation, forest degradation, enhancement of forest carbon stocks	The activities degradation and enhancement of forest carbon stocks are included for forest land remaining forest land, with a change only in the forest subcategory (see para. 11 of this document)
Pools included[b]	AB, BB	Litter, deadwood and soil organic carbon excluded (see para. 9 of this document)
Gases included	CO_2	See paragraph 9 of this document
Forest definition[c]	Included	Minimum area of 0.5 ha, height of 5 m or more and at least 10 per cent canopy cover; rubber plantations, oil palm plantations and perennial crops excluded (see para. 29 of this document)
Relationship with latest GHG inventory	Methods used for the FRL are not consistent with the most recent GHG inventory (2000)	Cambodia clarified that its FRL was constructed using improved data and information for the forest sector. The most recent data from Cambodia's national GHG inventory are for 2000; therefore, it was impossible to check for consistencies between that and the FRL. Cambodia plans to use the data and information from its FRL to improve future GHG inventories (see para. 15 of this document)
Description of relevant policies and plans[d]	Included	See paragraph 22 of this document

Main features of the FRL		*Remarks*
Description of assumptions on future changes in policies[d]	Not applicable	
Descriptions of changes to previous FRL	Not applicable	
Future improvements identified	Yes	Areas for future technical improvement were identified, subject to national capabilities and policies, and noting the importance of adequate and predictable support (see para. 34 of this document)

Abbreviations: AB = above-ground biomass, BB = below-ground biomass, FRL = forest reference level, GHG = greenhouse gas.

[a] If subnational, comments should include information on the treatment of displacement of emissions.

[b] In the case of omitted pools or activities, comments should include the justification provided by the country.

[c] The forest definition should be summarized, and it should be stated if it differs from the definition used in the greenhouse gas inventory or in reporting to other international organizations.

[d] May be relevant to the description of national circumstances, which is required in the case of adjustment.